US009239562B2

(12) **United States Patent**
Souda et al.

(10) **Patent No.: US 9,239,562 B2**
(45) **Date of Patent: Jan. 19, 2016**

(54) **IMAGE FORMING APPARATUS**

(71) Applicants: **Makoto Souda**, Nagoya (JP); **Hirotaka Mori**, Nagoya (JP); **Shougo Sato**, Seto (JP)

(72) Inventors: **Makoto Souda**, Nagoya (JP); **Hirotaka Mori**, Nagoya (JP); **Shougo Sato**, Seto (JP)

(73) Assignee: **Brother Kogyo Kabushiki Kaisha**, Nagoya-shi, Aichi-ken (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 183 days.

(21) Appl. No.: **13/621,481**

(22) Filed: **Sep. 17, 2012**

(65) **Prior Publication Data**

US 2013/0170857 A1 Jul. 4, 2013

(30) **Foreign Application Priority Data**

Dec. 28, 2011 (JP) 2011-288488

(51) **Int. Cl.**
G03G 15/00 (2006.01)
G03G 21/16 (2006.01)
G03G 15/01 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1647*** (2013.01); ***G03G 15/0189*** (2013.01); ***G03G 21/1623*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1623; G03G 21/1647
USPC 399/107, 116
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,821,681 B2 10/2010 Matsumoto
7,894,743 B2 2/2011 Tomatsu
8,699,911 B2 4/2014 Kaneko
2004/0101328 A1 * 5/2004 Kimura et al. 399/111
2008/0002341 A1 1/2008 Tomatsu
2008/0003015 A1 * 1/2008 Tomatsu 399/110
2008/0068680 A1 3/2008 Matsumoto
2009/0116869 A1 5/2009 Kotsuka et al.
2009/0142092 A1 * 6/2009 Sato 399/111
2009/0290904 A1 * 11/2009 Kawai et al. 399/111

(Continued)

FOREIGN PATENT DOCUMENTS

JP 54-107339 8/1979
JP 62050771 A * 3/1987 ..... G03G 15/00

(Continued)

OTHER PUBLICATIONS

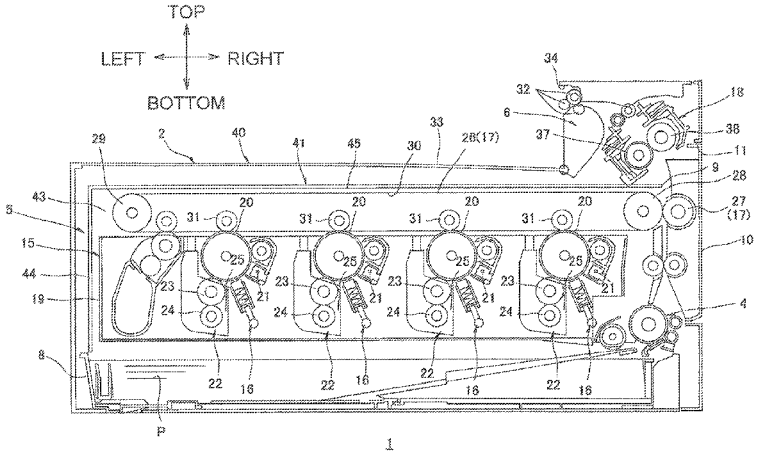
Sep. 8, 2015—(JP) Notice of Reasons for Rejection—App 2011-288488.

Primary Examiner — David Gray
Assistant Examiner — Thomas Giampaolo, II
(74) *Attorney, Agent, or Firm* — Banner & Witcoff, Ltd.

(57) **ABSTRACT**

An image forming apparatus includes a plurality of photosensitive drums, a frame member, a first sheet metal member, and a pressing member. The frame member is configured to accommodate the photosensitive drums such that the photosensitive drums are withdrawn along an axial direction thereof. The first sheet metal member is disposed on a first side of the frame member and configured to position the photosensitive drums. The pressing member is configured to press the photosensitive drums toward the first sheet metal member. The frame member includes a first wall disposed on a second side, opposite to the first side, of the frame member in the axial direction, a second wall disposed on a third side of the frame member and connected to the first wall, and a third wall disposed on an upper side relative to the photosensitive drums and connected to the first wall and the second wall.

16 Claims, 8 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0111562	A1*	5/2010	Okabe et al.	399/112
2010/0209140	A1*	8/2010	Kamimura et al.	399/111
2011/0188887	A1	8/2011	Kaneko	

FOREIGN PATENT DOCUMENTS

JP	08-262827	A	10/1996
JP	09-304985	A	11/1997
JP	11-258885	A	9/1999
JP	2004-029606	A	1/2004
JP	2006-239876	A	9/2006
JP	2007-199154	A	8/2007
JP	2008-009262	A	1/2008
JP	2008-070606		3/2008
JP	2010-026153	A	2/2010
JP	2010-164993	A	7/2010
JP	2010-204354	A	9/2010
JP	2011-150007	A	8/2011
JP	2011-158495	A	8/2011

* cited by examiner

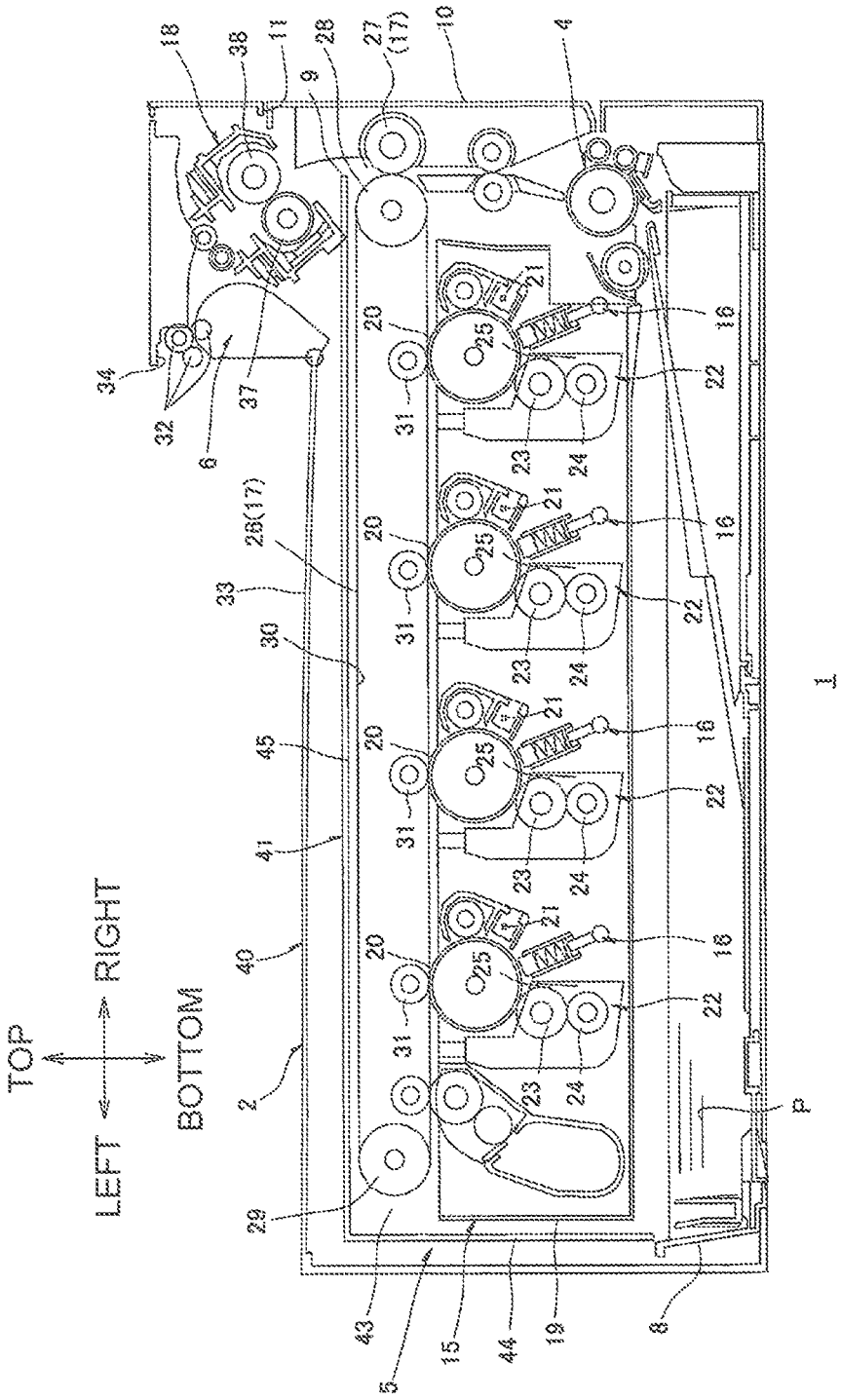

TOP
RIGHT
LEFT
BOTTOM
1
2
4
5
6
8
9
10
11
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
37
38
40
41
43
44
45
P

Fig.1

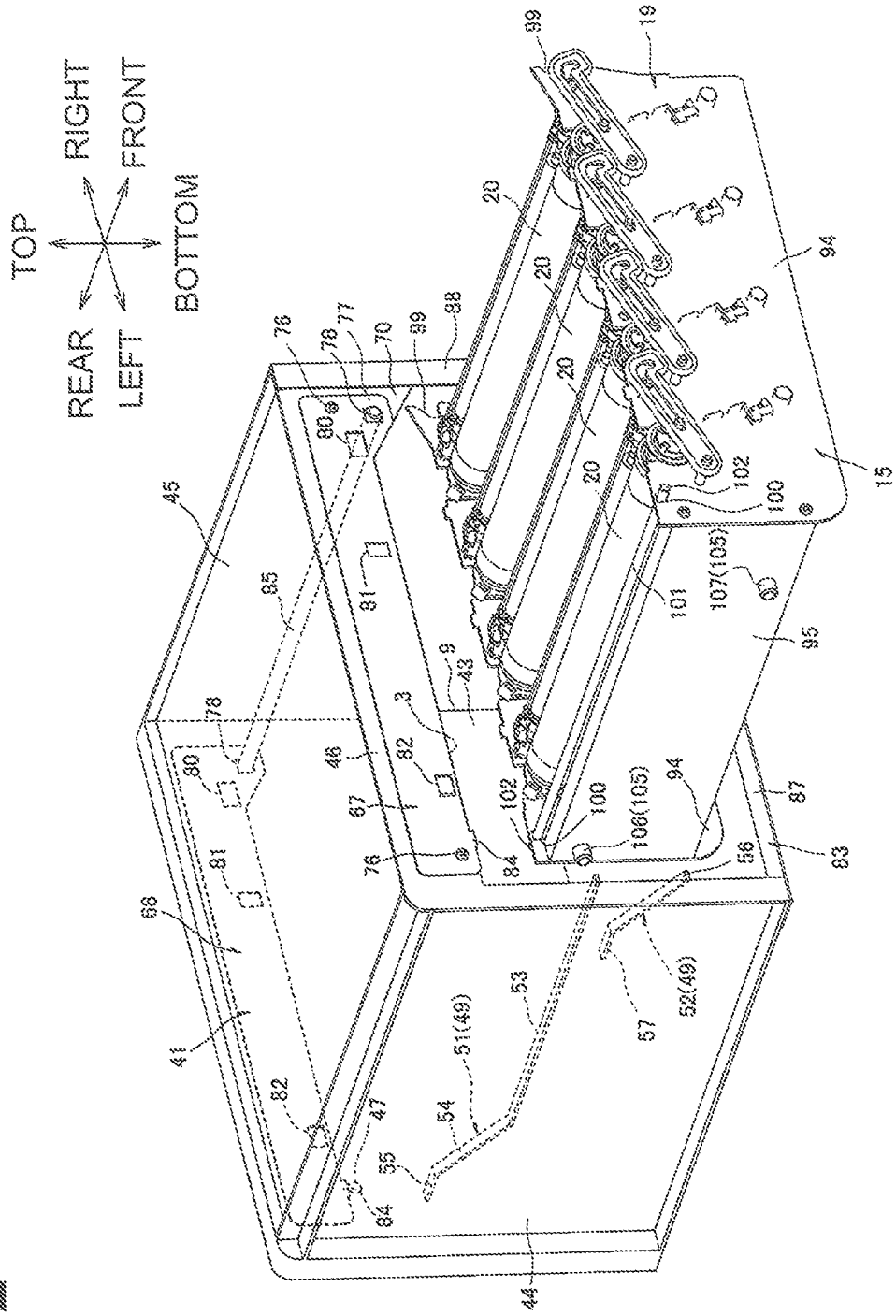

TOP
RIGHT
FRONT
REAR
LEFT
BOTTOM
19
20
94
15
45
85
81
9
43
3
78
80
46
82
67
76
84
102
100
106(105)
94
87
56
83
68
41
82
47
54
55
84
51(49)
53
57
52(49)
44
107(105)
101
95

Fig.2

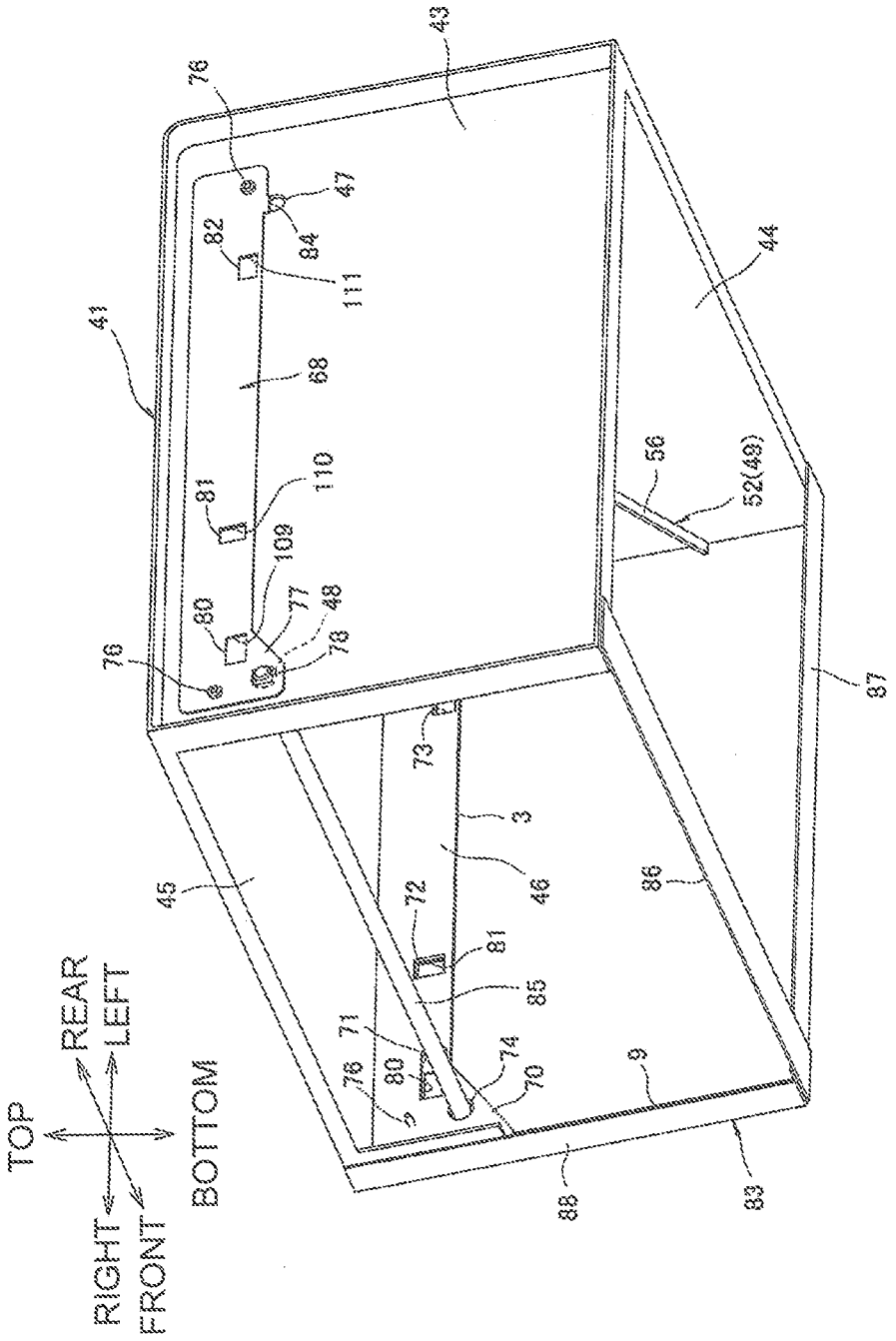

43
76
47
84
82
111
44
41
68
110
81
109
56
52(49)
80
77
48
78
76
87
73
3
46
45
72
86
81
85
71
74
76
80
70
9
88
89
TOP
REAR
LEFT
BOTTOM
RIGHT
FRONT

Fig.3

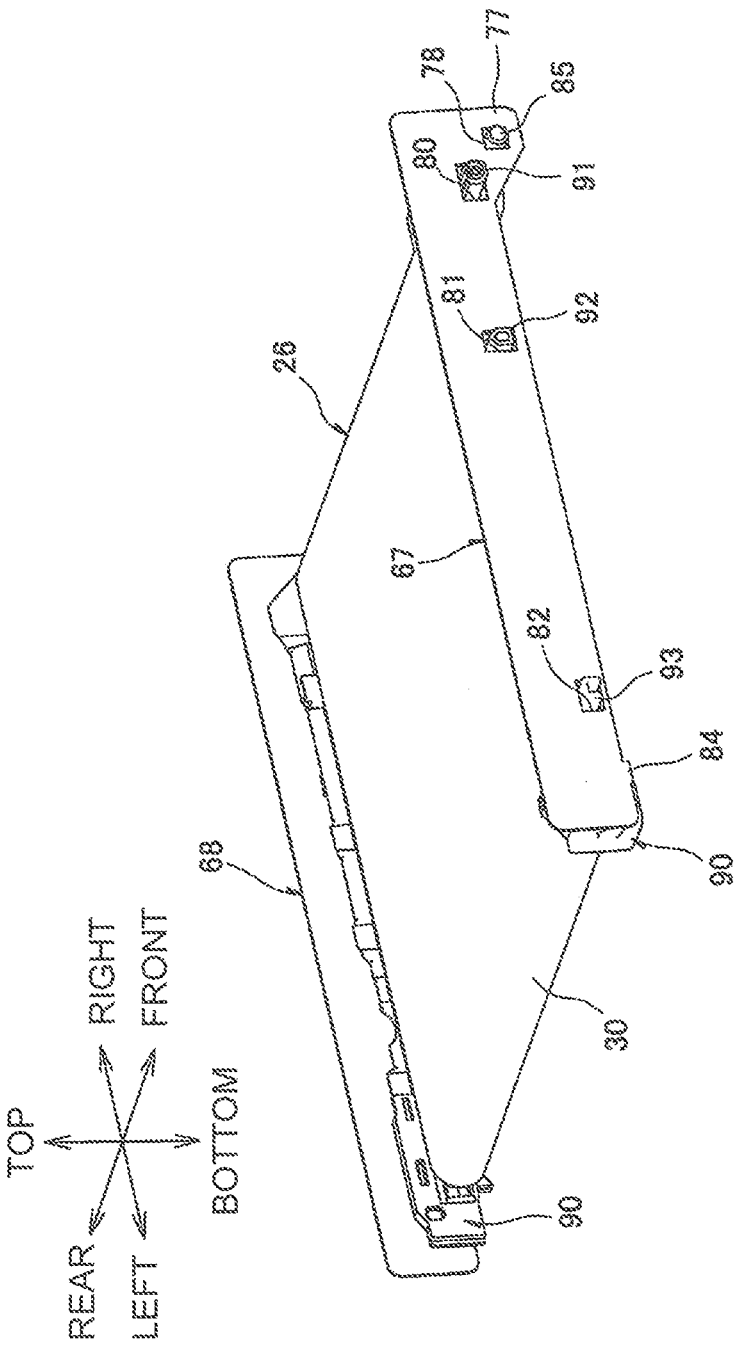

77
78
85
80
91
81
92
26
67
82
93
84
68
90
30
90
TOP
RIGHT
FRONT
BOTTOM
REAR
LEFT

Fig.4

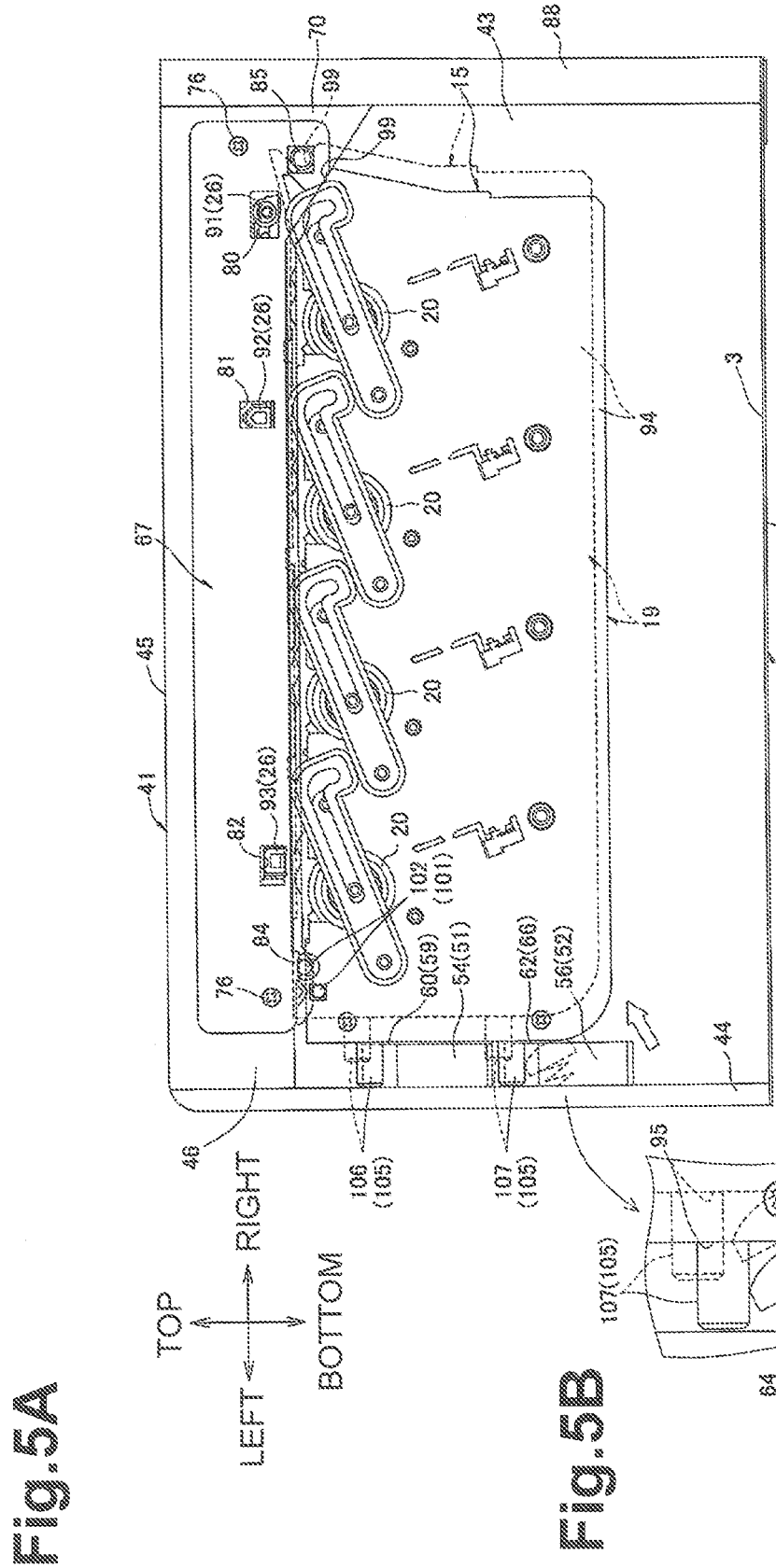

TOP
RIGHT
LEFT
BOTTOM
70
43
88
76
85
99
15
91(26)
80
92(26)
81
20
94
3
67
87
19
45
83
41
93(26)
82
102
(101)
84
60(59)
54(51)
62(66)
56(52)
44
46
106
(105)
107
(105)
95
65
64
50

Fig.5A

Fig.5B

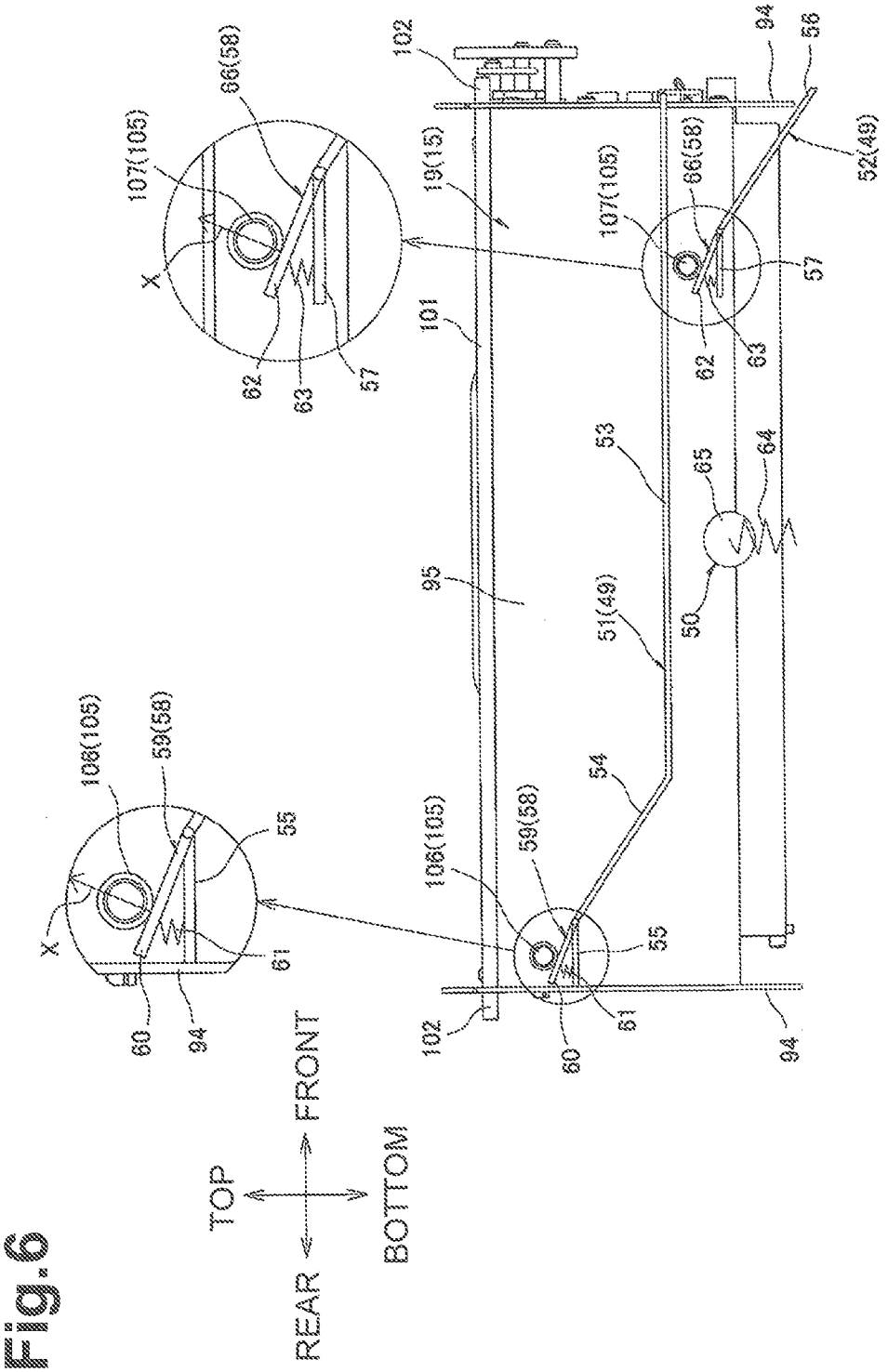

66(58)
107(105)
X
62
63
57
102
94
56
52(49)
19(15)
107(105)
66(58)
57
101
62
63
53
65
64
95
50
51(49)
108(105)
59(58)
55
54
106(105)
59(58)
X
55
61
60
94
102
61
60
94
TOP
FRONT
REAR
BOTTOM

Fig.6

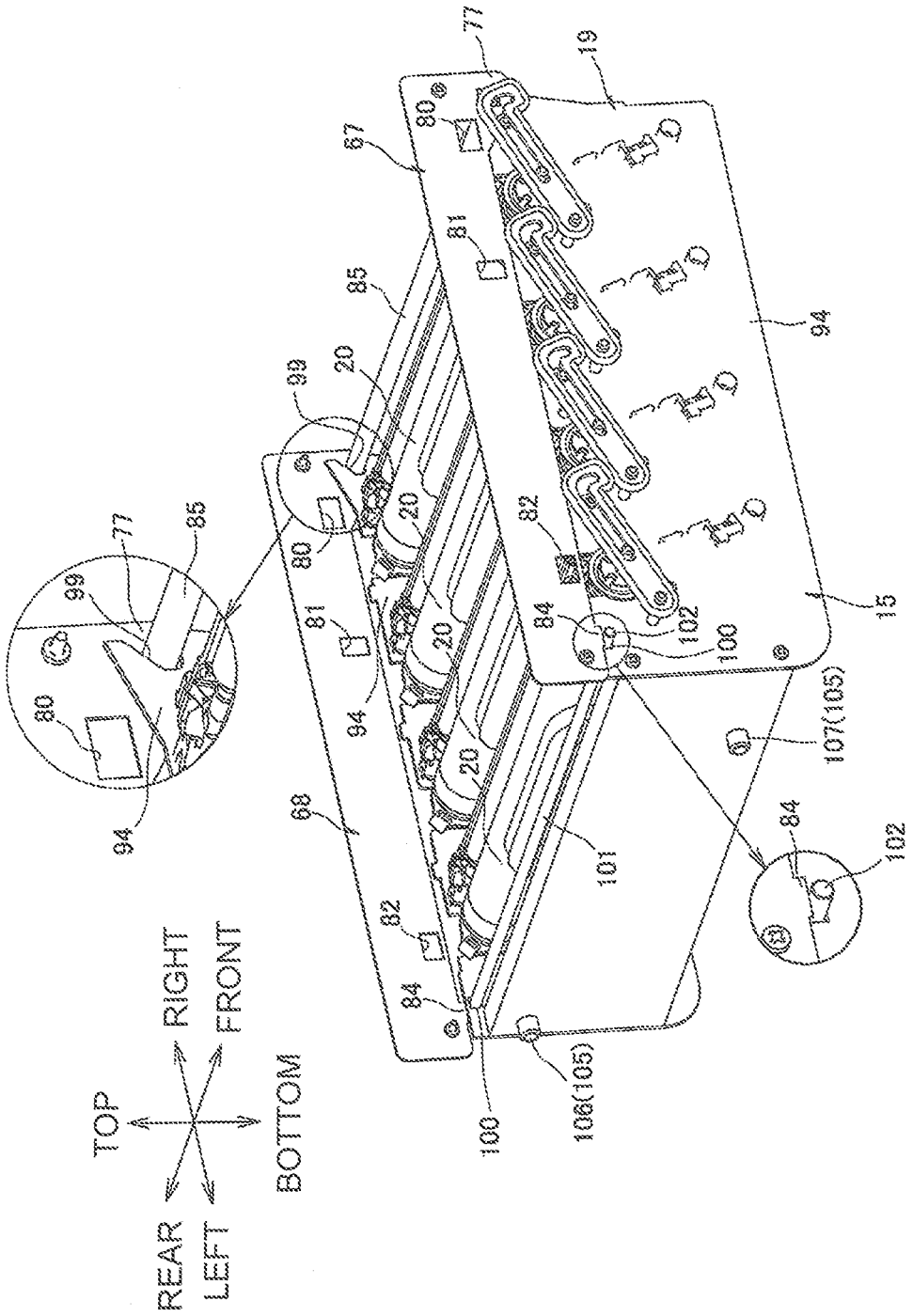

77
19
80
67
81
85
94
99
20
82
84
102
100
15
107(105)
68
101
106(105)
TOP
BOTTOM
RIGHT
FRONT
REAR
LEFT

Fig. 7

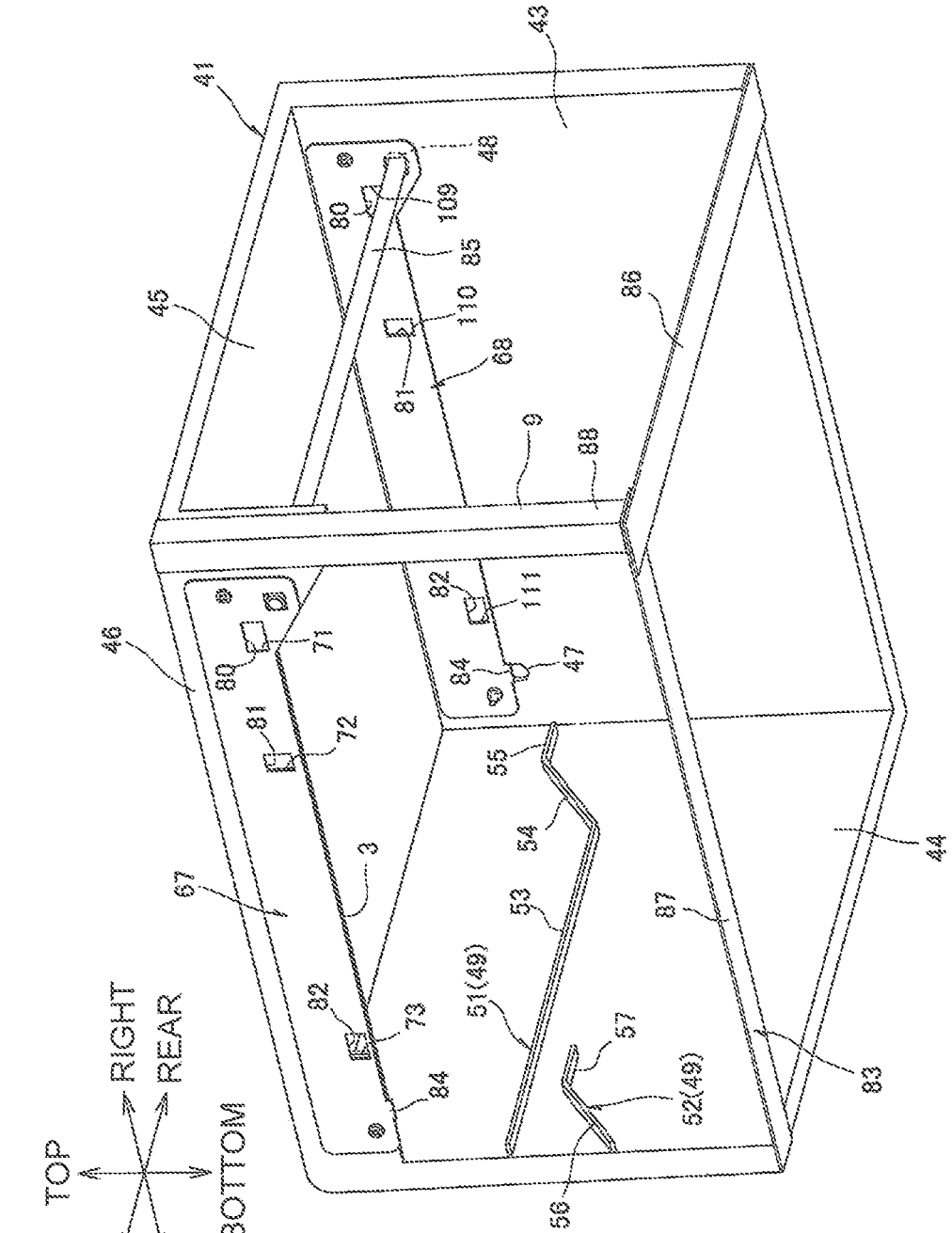

41
43
48
109
80
85
45
110
86
68
81
9
88
82
111
46
71
80
84
47
81
72
55
54
44
3
67
53
87
82
73
51(49)
57
84
52(49)
83
56
TOP
RIGHT
REAR
BOTTOM
FRONT
LEFT

Fig.8

IMAGE FORMING APPARATUS

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Japanese Patent Application No. 2011-288488, filed on Dec. 28, 2011, the entire subject matter of which is incorporated herein by reference.

FIELD

Aspects of the disclosure relate to an electrophotographic image forming apparatus.

BACKGROUND

A known electrophotographic image forming apparatus includes a main body casing, and process cartridges detachably attachable to the main body casing.

In the above image forming apparatus, the main body casing includes a pair of left and right frames made of resin, a pair of left and right metal frames fixed to inner surfaces of the left and right frames made of resin, and four pipes extending between the metal frames. The process cartridges each include a photosensitive drum extending in the left and right direction. The process cartridges are disposed between the pair of petal frames when attached to the main body casing.

In the image forming apparatus, to maintain the rigidity in the main body frame, the process cartridges are detachably attachable to the main body casing in substantially a top-bottom direction (which is a direction perpendicular to an axial direction of the photosensitive drum). In this configuration, it is difficult to detachably attach the process cartridges relative to the frame member along an axial direction of the process cartridges.

SUMMARY

Illustrative aspects of the disclosure provide an image forming apparatus including a frame member maintaining its rigidity and configured to allow photosensitive drums to be withdrawn relative to the frame member along an axial direction of the photosensitive drums.

According to an aspect of the disclosure, an image forming apparatus includes a plurality of photosensitive drums, a frame member, a sheet metal member, and a pressing member. The photosensitive drums are spaced apart from each other and arranged such that axes of the photosensitive drums are parallel relative to each other in an arrangement direction perpendicular to an axial direction of the photosensitive drums. The frame member is configured to accommodate the photosensitive drums such that the photosensitive drums are withdrawn along the axial direction. The first sheet metal member is disposed on a first side of the frame member and configured to position the photosensitive drums. The pressing member is configured to press the photosensitive drums toward the first sheet metal member. The frame member includes a first wall, a second wall, and a third wall. The first wall is disposed on a second side, opposite to the first side, of the frame member in the axial direction. The second wall is disposed on a third side of the frame member, the third side is connected to the first side and the second side, and the second wall is connected to the first wall. The third wall is disposed on an upper side relative to the photosensitive drums, and the third wall is connected to the first wall and the second wall.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative aspects will be described in detail reference to the following figures in which like elements are labeled with like numbers and in which:

FIG. **1** is a side sectional view of an illustrative image forming apparatus, e.g. a printer, according to a first embodiment of the disclosure;

FIG. **2** is a perspective view, looking from the front and top, of the printer illustrated in FIG. **1** from which a process unit is withdrawn;

FIG. **3** is a perspective view, looking from the bottom and acid rear, of an inside casing illustrated in FIG. **2**;

FIG. **4** is a perspective view, looking from the front and top, of a belt unit illustrated in FIG. **1**;

FIG. **5**A and **5**B are front views of the printer illustrated in FIG. **1**, where the process unit is accommodated;

FIG. **6** is a side sectional view of the printer illustrated in FIG. **5**, where the process unit is accommodated;

FIG. **7** is a perspective view, looking from the front and top, of the process unit, a first sheet metal member, and a second sheet metal member, illustrated in FIG. **2**; and

FIG. **8** is a perspective view, looking from the bottom and re of an inside casing of a printer according to a second embodiment of the disclosure.

DETAILED DESCRIPTION

A first illustrative embodiment will be described in detail with reference to the accompanying drawings.

As shown in FIGS. **1** and **2**, an image forming apparatus according to aspects of the invention applies to a printer **1**, which is a color printer of an intermediate transfer type.

As shown in FIG. **1**, the printer **1** includes, in a main body casing **2**, a sheet supply section **4** configured to supply a recording medium, e.g., a sheet P, an image forming section **5** configured to form an image on the sheet P supplied from the sheet supply section **4**, and a sheet ejection section **6** configured to eject the sheet P having the image.

The main body casing **2** is box-shaped. As shown in FIG. **2**, one side wall of the casing **2** contains an opening **3**.

In the following descriptions, the top or upper side, the bottom or lower side, the left or left side, the right or right side, the front or front side, and the rear or rear side are used to define the various parts when the printer **1** is disposed in an orientation in which it is intended to be used In this embodiment, the side on which the opening **3** is provided is referred to as the front or front side, and the opposite side is referred to as the rear or rear side. The left or left side and the right or right side are defined when the printer **1** is viewed from the front side.

As shown in FIG. **1**, the sheet supply section **4** includes a sheet supply tray **8** configured to store stack of sheets P therein. The sheet supply tray **8** is disposed in a bottom portion of the main body casing **2** and non-destructively detachable from and attachable to the main body casing **2**.

The sheets P in the sheet supply tray **8** are separated one by one and supplied to the image forming section **5** (specifically, between an intermediate transfer belt **30** and a secondary transfer roller **27**) at a specified time.

The image forming section **5** is disposed above the sheet supply section **4**, and includes a process unit **15**, a transfer unit **17**, and a fixing unit **18**.

The process unit **15** is disposed facing the sheet supply tray **8** from above, and includes photosensitive drums **20**, scorotron chargers **21**, and developing units **22**, and LED units **16**.

There are, for example, four photosensitive drums **20** for four different colors of black, yellow, magenta, and cyan, which are spaced apart from each other in the left-right direction and arranged such that their axes are parallel relative to each other and perpendicular to the left-right direction.

As shown in FIG. **2**, each of the photosensitive drums **20** has substantially a cylindrical shape, which extends in the front-rear direction, and is rotatably supported at upper ends of the process unit **15** such that each of the photosensitive drums **20** is exposed from above.

As shown in FIG. **1**, there are four scorotron chargers **21** corresponding to the photosensitive drums **20**. Each of the scorotron chargers **21** is disposed at the right of and spaced apart from a corresponding one of the photosensitive drums **20**.

There are four developing units **22** corresponding to the photosensitive drums **20**. Each of the developing units **22** is disposed facing a corresponding one of the photosensitive drums **20** from below. Each of the developing units **22** includes a developing roller **23**.

Each developing roller **23** is rotatably supported in an upper end of a corresponding developing unit **22** such that the developing roller **23** is exposed from above and contacts a corresponding photosensitive drum **20** from below.

Each developing unit **22** includes a supply roller **24** configured to supply toner to the developing roller **23**, and a layer-thickness regulating blade **25** configured to regulate a thickness of toner supplied to the developing roller **23**. Each developing unit **22** contains a developer, e.g. toner of one color.

There are four LED units **16** corresponding to the photosensitive drums **20**. Each of the LED units **16** is disposed at a small distance on a lower right side of a corresponding photosensitive drum **20** such that it faces the corresponding photosensitive drum **20** from below. Each LED unit **16** is configured to expose a surface of its corresponding photosensitive drum **20** based on image data and form a latent image on the surface.

The transfer unit **17** includes a belt unit **26** and a secondary transfer roller **27**.

The belt unit **26** is disposed above the photosensitive drums **20** along the left-right direction so as to face the photosensitive drums **20** from above.

The belt unit **26** includes a drive roller **28**, a driven roller **29**, an endless belt, e.g. an intermediate transfer belt **30**, and four primary transfer rollers **31**.

The drive roller **28** and the driven roller **29** are spaced apart from each other in the left-right direction.

The intermediate transfer belt **30** is looped around the drive roller **28** and the driven roller **29** and disposed such that a lower side of the intermediate transfer belt **30** contacts the photosensitive drums **20**. In other words, the intermediate transfer belt **30** is disposed along the left-right direction.

The intermediate transfer belt **30** is configured to rotate upon rotation of the drive roller **28** in such a direction that the lower side contacting the photosensitive drums **20** moves from left to right.

The primary transfer rollers **31** are disposed within the intermediate transfer belt **30** and above the respective photosensitive drums **20** such that the lower side of the intermediate transfer belt **30** is sandwiched between the primary transfer rollers **31** and the photosensitive drums **20**.

The secondary transfer roller **27** is disposed opposite to the drive roller **28** of the belt unit **26** (the right end portion of the belt unit **26**) with the intermediate transfer belt **30** interposed therebetween.

The fixing unit **18** is disposed above the secondary transfer roller **27**, and includes a heat roller **37** and a pressure roller **38** disposed facing the heat roller **37**.

In each developing unit **22**, toner is supplied to the supply roller **24** and then supplied from the supply roller **24** to the developing roller **23**.

Toner supplied to the developing roller **23** is positively charged between the supply roller **24** and the developing roller **23** by friction with rotation of the developing roller **23**, regulated to a specified thickness by the layer-thickness regulating blade **25** and then carried on a surface of the developing roller **23** as a thin layer.

The surface of the photosensitive drum **20** is uniformly and positively charged by the scorotron charger **21** along with rotation of the photosensitive drum **20**, and then exposed by the LED unit **16**. Thus, a latent image corresponding to an image to be formed on a sheet P is formed on the surface of the photosensitive drum **20**.

When the photosensitive drum **20** further rotates, the toner carried on the surface of the developing roller **23** is supplied to the latent image formed on the surface of the photosensitive drum **20**. With this, the latent image on the photosensitive drum **20** is visualized into a toner image, which is carried on the surface of the photosensitive drum **20** by reversal developing. In this manner, toner images are earned on the surfaces of the respective photosensitive drums **20**.

The toner images carried on the surfaces of the respective photosensitive drums **20** by reversal developing are primarily transferred to the lower side of the intermediate transfer belt **30** moving from the left to the right. At this time, the toner images are sequentially overlapped one over the other to form a toner image on the intermediate transfer belt **30**.

The toner image formed on the intermediate transfer belt **30** is secondarily transferred to a sheet P supplied from the sheet supply section **4** when the toner image formed on the intermediate transfer belt **30** passes a position where the toner image faces the secondary transfer roller **27**.

The toner image transferred to the sheet P is thermally fixed at the fixing unit **18** while the sheet P passes between the heat roller **37** and the pressure roller **38**.

An upper surface of the casing **2** contains an ejection tray **33** to which the sheet P is to be ejected. The sheet ejection section **6** is disposed at an upper right end portion of the casing **2** and protrudes upward more than the ejection tray **33**.

The sheet ejection section **6** has an ejection opening **34** formed above the ejection tray **33**. The sheet P is to be ejected from the ejection opening **34**. The sheet ejection section **6** includes a plurality of, e.g., three, ejection rollers **32**, which are disposed in the ejection opening **34** and configured to feed the sheet P to the ejection tray **33**.

The sheet P having the toner image fixed at the fixing unit **18** is ejected onto the ejection tray **33** by the ejection rollers **32**.

As shown in FIG. **1**, the main body casing **2** includes an outside casing **40** constituting an outer shape of the printer **1** and an inside casing **41**, as an example of a frame member, which is disposed inside the outside casing **40**.

The outside casing **40** is shaped like a rectangular box as viewed from a side, and its right sidewall has an opening **11**. The outside casing **40** includes a side cover **10** configured to move, e.g., pivot around its lower end, between a close position to close the opening **11** and an open position to open the opening **11**. The outside casing **40** supports the secondary transfer roller **27** rotatably.

When the side cover **10** is in the open position, rollers in the sheet supply section **4** (defining a sheet conveyance path where a sheet P is conveyed) are exposed from the right side

via a jam opening **9** and the opening **11**. Thus, if a sheet P is jammed at any roller in the sheet supply section **4**, the jammed sheet P can be easily removed by opening the side cover **10**.

The inside casing **41** is shaped like a rectangular box as viewed from a side, as shown in FIG. **2**. The inside casing **41** has a top-bottom dimension and a left-right dimension sufficient to accommodate the sheet supply section **4** and the image forming section **5** (except for the secondary transfer roller **27**, hereinafter the same). The inside casing **41** is accommodated in the outside casing **40** such that the inside easing **41** is left-aligned to provide a space on the right side for placing the side cover **10** on the right side of the outside easing **40**.

As shown in FIG. **2**, the inside casing **41** integrally includes a rear **43** as an example of a first wall, a left wall **44** as an example of a second wall, an upper wall **45** as an example of a third wall, and a sheet metal fixing wall **46** as an example of a resin-trade frame.

As shown in FIG. **3**, the rear wall **43** is formed like a flat plate having a rectangular shape as viewed from the rear side. The rear wall **43** is made of resin.

The rear wall **43** has a first reference shaft hole **48** in which a rear end portion of a reference shaft **85** engages, a first opening **109** in which a rear-side bearing portion **91** engages, a second opening **110** in which a rear-side first positioning protrusion **92** engages, a third opening **111** in which a rear-side second positioning protrusion **93** engages, and an engagement shaft hole **47** in which a rear end portion of an engagement shaft **101** engages.

The first reference shaft hole **48** is formed through a right end portion in an upper portion of the rear wail **43**, and has substantially a circular shape as viewed from the rear side. The first reference shaft hole **48** has a diameter greater than an outside diameter of the reference shaft **85**.

The first opening **109** is formed through the rear wall **43** in an upper left portion of the first reference shaft hole **48**, and has substantially a rectangular shape as viewed from the rear side.

The second opening **110** is formed through the rear wall **43** on the left side of the first opening **109**, and has substantially a rectangular shape as viewed from the rear side.

The third opening **111** is formed through the rear wall **43** on the left side of the second opening **110**, and has substantially a rectangular shape as viewed from the rear side,

The engagement shaft hole **47** is formed through the rear wall **43** in a lower left portion of the third opening **111**. The engagement shaft hole **47** has a diameter greater than an outside diameter of the engagement shaft **101**.

As shown in FIG. **2**, the left wall **44** is made of resin, formed like a flat plate and extends frontward from a left end portion of the rear wall **43**.

A right surface of the left wall **44** includes a guide portion **49** and a first pressing member **50** (FIG. **5**B) as an example of a pressing member.

The guide portion **49** includes an upper guide portion **51** and a lower guide portion **52**.

The upper guide portion **51** is disposed in a vertical central portion of the left wall **44** and formed like a flat plate protruding rightward from the right surface of the left wall **44**. The upper guide portion **51** integrally includes a horizontal portion **53**, an inclined portion **54** as an example of a second guide portion, and an upper spring support portion **55**.

The horizontal portion **53** extends rearward from a front end of the left wall **44**.

The inclined portion **54** continues from a rear end portion of the horizontal portion **53** and is inclined upward toward the rear side.

The upper spring support portion **55** continues from a rear end portion of the inclined portion **54** and extends rearward.

The lower guide portion **52** is disposed below the upper guide portion **51** and is shaped like a flat plate protruding rightward from the right surface of the left wall **44**. The lower guide portion **52** includes an inclined portion **56** as an example of a second guide portion and a lower spring support portion **57**.

The inclined portion **56** is inclined upward from the front end portion of the left wall **44** toward the rear side thereof The inclined portion **56** has a front-rear dimension and a top-bottom dimension, which are substantially equal to those of the inclined portion **54** of the upper guide portion **51**.

The lower spring support portion **57** continues from a rear end portion of the inclined portion **56** and extends rearward.

As shown in FIG. **6**, the guide portion **49** includes a second pressing member **58** as an example of a pressing member.

The second pressing member **58** includes an upper pressing portion **59** corresponding to the upper guide portion **51** and a lower pressing portion **66** corresponding to the lower guide portion **52**.

The upper pressing portion **59** is disposed on an upper surface of the upper spring support portion **55** of the upper guide portion **51**, and includes an upper pivotable portion **60** and a coil spring **61**.

The upper pivotal portion **60** is shaped like a flat plate, and is disposed such that the upper pivotable portion **60** is pivotable about its front end portion relative to the upper spring support portion **55**.

The coil spring **61** is interposed between the rear end portion of the upper spring support portion **55** and the upper pivotable portion **60** such that the coil spring **61** expands and contracts vertically.

With this configuration, the upper pivotable portion **60** is urged upward (specifically, clockwise direction as viewed from a rear side) and is inclined upward toward the rear side under normal conditions.

The lower pressing portion **66** is disposed on an upper surface of the lower spring support portion **57** of the lower guide portion **52**, and includes a lower pivotable portion **62** as an example of a first guide portion and a coil spring **63**.

The lower pivotable portion **62** is shaped like a flat plate, and is disposed such that the lower pivotable portion **62** is pivotable about its front end portion relative to the lower spring support portion **57**.

The coil spring **63** is interposed between the rear end portion of the horizontal portion **63** and the rear end portion of the lower pivotable portion **62** such that the coil spring **63** expands and contracts vertically.

With this configuration, the lower pivotable portion **62** is urged upward (specifically, in a clockwise direction as viewed from a rear side) and is inclined upward toward the rear side.

As shown in FIG. **5**A and **5**B, the first pressing member **50** is disposed in a central portion of the left wall **44** (FIG. **6**) in the front-rear direction such as to correspond to a lower end portion of a left sidewall **95** of a drawer frame **19**. The first pressing member **50** includes an urging member **64** and a contact portion **65**.

As shown in FIG. **513**, the urging member **64** is shaped like a coil spring and a base portion of the urging member **64** is fixed to the right surface of the left wall **44** such that the urging member **64** expands and contacts in an upper right direction and a lower left direction.

The contact portion **65** is shaped like a letter D as viewed from the front side, bulging in an upper right direction, and is fixed to a free end of the urging member **64**.

The first pressing member **50** is configured to move between an advance position where the contact portion **65** advances in the upper right direction and a withdrawal position where the contact portion **65** withdraws toward the lower left direction. The first pressing member **50** is located in the withdrawal position by a regulating member (not shown) under normal circumstances.

As shown in FIG. **2**, the upper wall **45** is made of resin, shaped like a flat plate, and disposed such that the upper wall **45** connects upper end portions of the rear wall **43** and the left wall **44**.

The sheet metal fixing wall **46** is made of resin and shaped like a flat plate. The sheet metal fixing wall **46** extends downward from a front end portion of the upper wall **45**. The sheet metal fixing wall **46** has a top-bottom dimension which is about one-fifths of the top-bottom dimension of the left wall **44**.

As shown in FIG. **3**, the sheet metal fixing wall **46** has a first through hole **71** in which a front-side bearing portion **91** engages, a second through hole **72** in which a front-side first positioning protrusion **92** engages, and a third through hole **73** in which a front-side second positioning protrusion **93** engages.

The first through hole **71** is formed through a right end portion of the sheet metal fixing wall **46**, and has substantially a rectangular shape as viewed from the rear side.

The second through hole **72** is formed through the sheet metal fixing wall **46** on the left side of the first through hole **71**, and has substantially a rectangular shape as viewed from the rear side.

The third through hole **73** is formed through the sheet metal fixing wall **46** on the left side of the second through hole **72**, and has substantially a rectangular shape as viewed from the rear side.

The sheet metal fixing wall **46** integrally includes an extension portion **70**.

The extension portion **70** is shaped like a flat plate having substantially a triangular shape as viewed from the rear side, and extends downward from a lower end portion of a right end portion of the sheet metal fixing wall **46**.

The extension portion **70** has a second reference shaft hole **74** in a central portion of the extension portion **70**.

The second reference shaft hole **74** is formed to receive a front end of the reference shaft **85** and has substantially a circular shaft as viewed from the rear side. The second reference shaft hole **74** has a diameter greater than the outside diameter of the reference shaft **85**.

The inside casing **41** includes a reinforcing portion **83**, a first sheet metal member **67** (FIG. **2**), and a second sheet metal member **68**.

The reinforcing portion **83** includes a first reinforcing member **86**, a second reinforcing member **87**, and a third reinforcing member **88**.

The first reinforcing member **86** is made of metal and shaped like a flat plate extending frontward from a right end portion of the lower end of the rear wall **43**.

The second reinforcing member **87** is made of metal and shaped like a flat plate extending rightward from a front end portion of the lower end of the left wall **44**.

The third reinforcing member **88** is made of metal and is substantially L-shaped as viewed from the top, as shown in FIG. **2**. The third reinforcing member **88** extends vertically and an upper end portion of the third reinforcing member **88** is fixed to an L-shaped portion, as viewed from the top, which is formed by the front end portion of the right end of the upper wall **45** and the right end portion of the front end of the upper wall **45**. In other words, the third reinforcing member **88** extends downward from the upper wall **45** such as to cover the right end portion of the sheet metal fixing wall **46**.

As shown in FIG. **3**, a front end portion of the first reinforcing member **86**, a light end portion of the second reinforcing member **87**, and a lower end portion of the third reinforcing member **88** are coupled.

With this coupling, the opening **3** having substantially a rectangular shape as viewed from the front side is defined by the front end portion of the left wall **44**, the lower end portion of the sheet metal fixing wall **46**, the second reinforcing member **87** and the third reinforcing member **88** in the front surface of the inside casing **41**.

In the right surface of the inside casing **41**, the jam opening **9** having a rectangular shape as viewed from the right side is defined by the right end portion of the rear wall **43**, the right end portion of the upper wall **45**, the first reinforcing member **86**, and the third reinforcing member **88**.

As shown in FIG. **2**, the first sheet metal member **67** and the second sheet metal member **68** are disposed opposite to each other in the left-right direction in the upper portion of the inside casing **41**, and formed from a common mold into an identical shape and size.

Thus, the following will describe the first sheet metal member **67**. Those elements corresponding to elements of the first sheet metal member **67** are identified with the same numerals, and thus and the description of the second sheet metal member **68** will be omitted for the sake of brevity

As shown in FIG. **2**, the first sheet metal member **67** is shaped like a fiat plate elongated in the left-right direction.

As shown in FIG. **4**, the first sheet metal member **67** has a bearing portion insertion hole **80** corresponding to the bearing portion **91**, a first positioning hole **81** corresponding to the first positioning protrusion **92**, and a second positioning hole **82** corresponding to the second positioning protrusion **93**.

The bearing portion insertion hole **80** is formed through a rear end portion of the first sheet metal member **67** and has substantially a rectangular shape as viewed from the front side.

The first positioning hole **81** is formed through the first sheet metal member **67** on the left side of the bearing portion insertion hole **80**, and has substantially a rectangular shape as viewed from the front side.

The second positioning hole **82** is formed through the first sheet metal member **67** on the left side of the first positioning hole **81**, and has substantially a rectangular shape as viewed from the front side.

The first sheet metal member **67** integrally includes a contact portion **84** and a reference shaft fixing portion **77**.

The contact portion **84** protrudes downward from the lower end of the left end portion of the first sheet metal member **67** and has substantially a rectangular shape as viewed from the front side.

The reference shaft fixing portion **77** has substantially a rectangular shape, as viewed from the front side, which extends downward from the lower end of the right end portion of the first sheet metal member **67**. A left end portion of the reference shaft fixing portion **77** is inclined upward toward the left such as to align with the left end of the extension portion **70**.

The reference shaft fixing portion **77** has a reference shaft fixing hole **78** formed through in a central portion of the reference shaft fixing portion **77**. The reference shaft fixing hole **78** has substantially a rectangular shape as viewed from the front side, and has a top-bottom dimension and a left-right dimension, which are substantially equal to an outer diameter of a reference shaft **85**.

As shown in FIG. **2**, the first sheet metal member **67** is fixed to a front surface of the sheet metal fixing wall **46** by screws **76** such that the reference shaft fixing hole **78** communicates with the second reference shaft hole **74** (FIG. **3**) and the contact portion **84** protrudes downward from the lower end of the sheet metal fixing wall **46**.

With this configuration, as shown in FIG. **3**, the bearing portion insertion hole **80** communicates with the first through hole **71**, the first positioning hole **81** communicates with the second through hole **72**, and the second positioning hole **82** communicates with the third through hole **73**.

The second sheet metal member **68** is fixed to a rear surface of the rear wall **43** by screws **76** such that the reference shaft fixing hole **78** communicates with the first reference shaft hole **48** (FIG. **2**) and the contact portion **84** overlaps with an upper portion of the engagement shaft hole **47**.

With this configuration, the bearing portion insertion hole **80** communicates with the first opening **109**, the first positioning hole **81** communicates with the second opening **110**, and the second positioning hole **82** communicates with the third opening **111**.

As shown in FIGS. **2** and **4**, the reference shaft **85** (FIG. **2**) and the belt unit **26** (FIG. **4**) are held between the first sheet metal member **67** and the second sheet metal member **68**.

As shown in FIGS. **2**, **3**, and **7**, the belt unit **26** is omitted for the sake of brevity.

As shown in FIG. **2**, the reference shaft **85** extends in the front-rear direction and is shaped like a circular cylinder. A front end portion of the reference shaft **85** is inserted into the second reference shaft hole **74** of the sheet metal fixing wall **46** (FIG. **3**), and a rear end portion of the reference shaft **85** is inserted into the first reference hole **48** of the rear wall **43** and the reference shaft fixing hole **78** of the second sheet metal member **68** (FIG. **3**).

As the reference shaft **85** extends between the first sheet metal member **67** and the second sheet metal member **68** and has an outside diameter which is substantially equal to the top-bottom dimension and the left-right dimension of the reference shaft fixing hole **78**, displacements of the reference shaft **85** relative to the first sheet metal member **67** and the second sheet metal member **68** in a top-bottom direction and the left-right direction are restricted.

As shown in FIG. **4**, the belt unit **26** includes a pair of belt frames **90** disposed opposite to each other in the front-rear direction. In FIG. **4**, the inside casing **41** is omitted for the sake of brevity.

Each of the belt frames **90** is shaped like a flat plate elongated in the left-right direction.

Each of the belt frames **90** includes the bearing portion **91**, the first positioning protrusion **92**, and the second positioning protrusion **93**.

The bearing portion **91** is disposed at a right end portion of the belt frame **90** and is shaped like a cylinder extending outward from an outer surface of the belt frame **90** in the front-rear direction.

The first positioning protrusion **92** is disposed on the left side of the bearing portion **91**, has substantially a rectangular shape, as viewed from the front side, and protrudes outward from the outer surface of the belt frame **90** in the front-rear direction.

The second positioning protrusion **93** is disposed on the left side of the first positioning protrusion **92**, is substantially U-shaped as viewed from the front side, and protrudes outward from the outer surface of the belt frame **90** in the front-rear direction.

The drive roller **28**, the driven roller **29**, the intermediate transfer belt **30** and the four primary transfer rollers **31** are held between the belt frames **90**.

The drive roller **28** is rotatably supported at its front end portion by the front-side bearing portion **91** and at its rear end portion by the rear-side bearing portion **91**.

The belt unit **26** is disposed such that the belt frames **90** are sandwiched between the first sheet metal member **67** and the second sheet metal member **68** in the front-rear direction.

Thus, the front--side bearing portion **91** is inserted through the first through hole **71** (FIG. **3**) into the bearing portion insertion hole **80** of the first sheet metal member **67** from the rear side, the front-side first positioning protrusion **92** is inserted through the second through hole **72** (FIG. **3**) into the first positioning hole **81** of the first sheet metal member **67** from the rear side, and the front-side second positioning protrusion **93** is inserted through the third through hole **72** (FIG. **3**) into the second positioning hole **82** of the first sheet metal member **67** from rear side.

The rear-side bearing portion **91** is inserted through the first opening **109** into the bearing portion insertion hole **80** of the second sheet metal member **68** from the front side, the rear-side first positioning protrusion **92** is inserted through the second opening **110** into the first positioning hole **81** of the second sheet metal member **68** from the front side, and the rear-side second positioning protrusion **93** is inserted through the third opening **111** into the second positioning hole **82** of the second sheet meal member **68** from the front side.

Thus, the belt unit **26** is positioned relative to the first sheet metal member **67** and the second sheet metal member **68**.

As shown in FIG. **2**, the process unit **15** includes a drawer frame **19** as an example of a holding unit.

The drawer frame **19** is configured to slide in the front-rear direction between an accommodation position where the drawer frame **19** is accommodated in the inside casing **41** (FIG. **1**) and a withdrawal position where the drawer frame **19** is withdrawn from the inside casing **41** (FIG. **2**),

The drawer frame **19** is shaped like an open-topped rectangular box. The drawer frame **19** includes a pair of sidewalls **94** disposed opposite to and spaced apart from each other in the front-rear direction, and a left sidewall **95** extending between left end portions of the sidewalls **94**.

Each of the sidewalls **94** is made of metal and shaped like a flat plate having a rectangular shape as viewed from the front side.

Each of the sidewalls **94** has an engagement groove portion **99** as an example of a second engaging portion and an engagement shaft support hole **100**.

The engagement groove portion **99** is formed in an upper end portion of a right end portion of each sidewall **94**, and is shaped like substantially a letter which is recessed leftward from the right end of the sidewall **94**. In other words, the right end portion of the drawer frame **19** has two engagement groove portions **99** spaced apart from each other in the front-rear direction.

The engagement shaft support hole **100** is formed in an upper end portion of a left end portion of each sidewall **94**, and is shaped like a rectangle as viewed from the front side. The engagement shaft support hole **100** has a top-bottom dimension and a left-right dimension which are substantially equal to an outside diameter of the engagement shaft **101**.

The engagement shaft **101** is disposed between the sidewalls **94**.

The engagement shaft **101** extends in the front-rear direction and is shaped like a circular cylinder. The engagement shaft **101** has a front-rear dimension which is longer than a distance between the sidewalls **94**.

The front and rear end portions of the engagement shaft **101** are inserted into the engagement shaft support holes **100** of the sidewalls **94**, and the engagement shaft **101** is supported by the sidewalls **94**. As the engagement shaft **101** has an outside diameter which is substantially equal to the top-bottom dimension and the left-right dimension of the engagement shaft support hole **100**, displacements of the engagement shaft **101** relative to the sidewalls **94** in the top-bottom direction and the left-right direction are restricted.

The front and rear end portions of the engagement shaft **101** protrudes outward from the respective side-walls **94** in the front-rear direction, and function as contact portions **102** as an example of a first engaging portion. In other words, the contact portions **102** are disposed in front and rear end portions, respectively, of a left end portion of the drawer frame **19**.

The left sidewall **95** is shaped like a flat plate having substantially a rectangular shape. The left sidewall **95** has, on its left surface, guide bosses **105** as an example of a guided portion.

The guide bosses **105** include an upper guide boss **106** corresponding to the upper guide portion **51** and a lower guide boss **107** corresponding to the lower guide portion **52**.

The upper guide boss **106** is disposed in an upper portion of a rear end portion of the left sidewall **95** as shown in FIG. **6**, and is shaped like a cylinder protruding leftward from the left surface of the left sidewall **95** as shown in FIG. **2**.

The lower guide boss **107** is disposed in a front side portion of a lower portion of the left sidewall **95** as shown in FIG. **6**, and is shaped like a cylinder protruding leftward from the left surface of the left sidewall **95** as shown in FIG. **2**.

The drawer frame **19** integrally holds the four photosensitive drums **20**, the four scorotron chargers **21** (FIG. **1**), the four developing units **22** (FIG. **1**), and the four LED units **16** (FIG. **1**).

Front and rear end portions of the photosensitive drums **20** are supported by the sidewalls **94** such that the photosensitive drums **20** are rotatable and their upper portions are exposed from above. Thus, the photosensitive drums **20** are positioned relative to the sidewalls **94**.

Front and rear end portions of the scorotron chargers **21** (FIG. **1**), the developing units **22** (FIG. **1**), and the LED units **16** (FIG. **1**) are fixed to the sidewalls **94** such that they extend in the front-rear direction.

Next, the following will describe attachment or removal of the process unit **15** relative to the inside casing **41**.

When the process unit **15** is attached to the inside casing **41**, as shown in FIG. **2**, the process unit **15** is located in front of the opening **3**.

Then, the process unit **15** is moved rearward and inserted into the inside casing **41** from the rear end portion.

The upper guide boss **106** of the drawer frame **19** is guided by the upper surface of the horizontal portion **53** of the upper guide portion **51**, and the process unit **15** is inserted rearward into the inside casing **41** along the front-rear direction.

When the process unit **15** is moved rearward relative to the inside casing **41** until the upper guide boss **106** reaches the rear end portion of the horizontal portion **53**, the lower guide boss **107** reaches the front end portion of the inclined portion **56** of the lower guide portion **52**.

When the process unit **15** is pressed further rearward into the inside casing **41**, the upper guide boss **106** is guided by the upper surface of the inclined portion **54** of the upper guide portion **51**, and the lower guide boss **107** is guided by the upper surface of the inclined portion **56** of the lower guide portion **52**.

Thus, the process unit **15** or drawer frame **19** is moved rearward and upward by the inclined portion **54** of the upper guide portion **51** and the inclined portion **56** of the lower guide portion **52**.

Then, the upper guide boss **106** reaches the front end portion of the upper pivotable portion **60** of the upper pressing portion **59**, and the lower guide boss **107** reaches the front end portion of the lower pivotable portion **62** of the lower pressing portion **66** (FIG. **6**).

When the process unit **15** is pressed further into the inside casing **41**, the upper guide boss **106** is guided by the upper pivotable portion **60**, the lower guide boss **107** is guided by the lower pivotable portion **62**, and the process unit **15** or drawer frame **19** is moved rearward and upward.

At this time, the rear end portion of the engagement shaft **101** is freely fit in the engagement shaft hole **47** of the rear wall **43** (FIG. **3**) from the front side.

Thus, the drawer frame **19** is located in the accommodation position where it is accommodated in the inside casing **41**.

At this time, as shown in FIG. **6**, the upper guide boss **106** is pressed in the upper front direction (or a pressing direction X) by the coil spring **61** via the upper pivotable portion **60**, while the lower guide boss **107** is pressed in the upper front direction (or a pressing direction Y) by the coil spring **63** via the lower pivotable portion **62**.

As shown in FIG. **5**B, the first pressing member **50** is moved from the withdrawal position to the advance position, and presses the left sidewall **95** of the drawer frame **19**.

Then as shown in FIG. **5**A, the drawer frame **19** is moved leftward and upward. In other words, the drawer frame **19** is pressed toward the first sheet metal member **67** and the second sheet metal member **68** by the first pressing member **50** and the second pressing member **58** (the upper pressing portion **59** and the lower pressing portion **66**). Thus, the photosensitive drums **20** supported by the drawer frame **19** are also pressed toward the first sheet metal member **67** and the second sheet metal member **68** by the first pressing member **50** and the second pressing member **58**.

At this time, the engagement groove portion **99** of the front-side sidewall **94** receives and contacts (or engages) the front end portion of the reference shaft **85** from an upper left side and from below, while the engagement groove portion **99** of the rear-side sidewall **94** receives and contacts (or engages) the rear end portion of the reference shaft **85** from an upper left side and from below.

The front-side contact portion **102** of the engagement shaft **101** contacts (or engages) the contact portion **84** of the first sheet metal member **67** from below, while the rear-side contact portion **102** of the engagement shaft **101** contacts (or engages) the contact portion **84** of the second sheet metal member **68**.

Thus, the drawer frame **19** is positioned relative to the first sheet metal member **67** and the second sheet metal member **68**, and the four photosensitive drums **20** are positioned via the drawer frame **19** relative to the first sheet metal member **67** and the second sheet metal member **68**.

As described above, the process unit **15** is attached to the inside casing **41**.

At this time, as shown in FIG. **5**A, the rear wall **43** is disposed on the rear side of the four photosensitive drums **20**, the left wall **44** is disposed on the left side of the leftmost photosensitive drum **20**, and the upper wall **45** is disposed above the four photosensitive drums **20**.

The sheet metal fixing wall **46** is disposed on the front side of the four photosensitive drums **20**.

To withdraw the process unit **15** from the inside casing **41**, the above attachment procedure is reversed.

Specifically, the process unit **15** is withdrawn toward the front side relative to the inside casing **41**.

As shown in FIG. **6**, the upper guide boss **106** is guided by the upper pivotable portion **60**, the lower guide boss **107** is guided by the lower pivotable portion **62**, and the process unit **15** (or the drawer frame **19**) is moved frontward and downward.

When the process unit **15** is withdrawn further frontward from the inside casing **41**, the upper guide boss **106** is guided by the upper surface of the inclined portion **54** of the upper guide portion **51**, and the lower guide boss **107** is guided by the upper surface of the inclined portion **56** of the lower guide portion **52**.

The inclined portion **54** of the upper guide portion **51** continues from a downstream end portion of the upper pivotable portion **60** in a withdrawal direction of the process unit **15**, and the inclined portion **56** of the lower guide portion **52** continues from a downstream end portion of the lower pivotable portion **62** in the withdraw direction.

Thus, the process unit **15** (or the drawer frame **19**) is moved frontward and downward by the inclined portion **54** of the upper guide portion **51** and the inclined portion **56** of the lower guide portion **52**.

Then, the upper guide boss **106** is guided by the upper surface of the horizontal portion **53** of the upper guide portion **51**, and the process unit **15** is withdrawn frontward through the opening **3** from the inside casing **41** along the front-rear direction.

In this manner, the drawer frame **19** is located in the withdrawal position where it is withdrawn from the inside casing **41**, and this completes withdrawal of the process unit **15** from the inside casing **41**.

According to the printer **1**, as shown in FIG. **2**, the four photosensitive drums **20** are configured to be withdrawn relative to the inside casing **41** along the front-rear direction (or an axial direction of the photosensitive drums **20**).

As the inside casing **41** includes the rear wall **43**, the left wall **44**, and the upper wall **45** integrally, it possesses adequate structural strength.

As the rear wall **43**, the left wall **44** and the upper wall **45** are integrally formed of resin, the reductions of the material cost and the weight of the printer **1** can be achieved.

When attached to or accommodated in the inside casing **41**, the four photosensitive drums **20** are pressed toward the first sheet metal member **67** by the first pressing member **50** and the second pressing member **58** (the upper pressing portion **59** and the lower pressing portion **66**) via the drawer frame **19** and thus positioned relative to the first sheet metal member **67**.

Thus, the four respective photosensitive drums **20** are precisely positioned relative to the inside casing **41**, and thus the positional relationship of the photosensitive drums **20** relative to the inside casing **41** remains invariant.

As a result, the structural strength of the inside casing **41** can be improved, the four photosensitive drums **20** can be withdrawn relative to the inside casing **21** along the axial direction of the photosensitive drums **20**, the reductions of the material cost and the weight of the printer **1** can be achieved, and the positional relationship of the photosensitive drums **20** relative to the inside casing **41** can be maintained.

The rear wall **43** includes the second sheet metal member **68** disposed opposite to and away from the first sheet metal member **67** in the front-rear direction (or the axial direction of the photosensitive drums **20**).

Thus, the structural strength of the inside casing **41** can be improved.

As a result, an improvement in the positional accuracy of the photosensitive drums **20**, which are positioned relative to the first sheet metal member **67**, with respect to the inside casing **41** can be obtained.

The inside casing **41** includes the sheet metal fixing wall **46**, which is disposed on the front side of the photosensitive drum **20** (or disposed on one side in the axial direction of the photosensitive drums **20**) and made of resin. The first sheet metal member **67** is fixed to the front surface of the sheet metal fixing wall **46**, and the second sheet metal member **68** is fixed to a rear surface of the rear wall **43**.

Thus, with a simple structure,the first sheet metal member **67** can be fixed to the inside casing **41** reliably.

As a result, the positional accuracy of the photosensitive drums **20**, which are positioned relative to the first sheet metal member **67**, with respect to the inside easing **41** can be obtained.

The first sheet metal member **67** and the second sheet metal member **68** can be attached to the inside casing **41** from outside.

Thus, the first sheet metal member **67** and the second sheet metal member **68** can be attached to the inside casing **41** with efficiency.

The reference shah **85** extends between the right end portions of the first sheet metal member **67** and the second sheet metal member **68**.

Thus, with a simple structure, an improvement in the structural strength of the inside casing **41** can be obtained,

The process unit **15** includes the drawer frame **19**.

The drawer flame **19** is configured to integrally hold the four photosensitive drums **20** and slide in the front-rear direction (or the axial direction of the photosensitive drums **20**) between the accommodation position (FIG. **1**) where the drawer frame **19** is accommodated in the inside casing **41** and the withdrawal position (FIG. **2**) where the drawer frame **19** is withdrawn from the inside casing **41**.

Thus, the four photosensitive drums **20** can be collectively withdrawn from the inside casing **41** by withdrawing the drawer frame **19** from the inside casing **41** toward the front side in the axial direction of the photosensitive drums **20**.

Thus, an improvement in the maintenance of the photosensitive drums **20** can be obtained.

The drawer frame **19** includes the front and rear sidewalls **94** which are paired. The sidewalls **94** support the engagement shaft **101** at their upper left end portions. Both ends of the engagement shaft **101** in the front-rear direction protrude outward from the respective sidewalls **94** in the front-rear direction and are formed as the contact portions **102**.

The sidewalls **94** have the engagement groove portions **99** at their upper right end portions respectively.

As shown in FIG. **5**A, when the drawer frame **19** is located in the accommodation position, the contact portions **102** engage the contact portions **84** of the first sheet metal member **67** and the second sheet metal member **68** respectively, and the engagement groove portions **99** engage the reference shaft **85**. Thus, the drawer frame **19** is positioned accurately relative to the inside casing **41**.

As a result, an improvement in positioning accuracy of the photosensitive drums **20** held by the drawer frame **19** relative to the inside casing **41** can be obtained.

Thus, an improvement in the maintenance of the photosensitive drums **20** can be obtained, and an improvement in the positioning accuracy of the photosensitive drums **20** relative to the inside casing **41** can be obtained.

The contact portions **102** are disposed in the front and rear end portions of the right end portion of the drawer frame **19**.

The engagement groove portions **99** are formed in the front and rear end portions of the right end portion of the drawer frame **19**.

Thus, when the drawer frame **19** is located in the accommodation position, the front and rear end portions of the left end portion of the drawer frame **19** are positioned relative to the first sheet metal member **67** and the second sheet metal member **68** via the contact portions **102**, and the front and rear end portions of the right end portion of the drawer frame **19** are positioned relative to the reference shaft **85** via the engagement shaft **99**. In other words, each end portion of the drawer frame **19** (or four corners of the drawer flame **19** in a plan view) is positioned accurately relative to the inside casing **41**.

Thus, a further improvement in the positioning accuracy of the photosensitive drums **20** held by the drawer frame **19** relative to the inside casing **41** can be obtained.

The contact portions **102** protrude outward in the front-rear direction from the respective sidewalls **94** (or protrude outward in the axial direction of the photosensitive drums **20**), and the engagement groove portions **99** are recessed from the right ends of the sidewalls **94** to the left side (inward in the arrangement direction of the photosensitive drums **20**).

Thus, with a simple structure, the contact portions **102** can engage the contact portions **84** of the first sheet metal member **67** and the second sheet metal member **68** reliably, and the engagement groove portions **99** can engage the reference shaft **85** reliably.

As shown in FIG. **6**, when the drawer frame **19** is withdrawn from the inside casing **41**, the upper guide boss **106** of the drawer frame **19** is guided by the upper pivotable portion **60** and then by the inclined portion **54**, and the lower guide boss **106** of the drawer frame **19** is guided by the lower pivotable portion **62** and then by the inclined portion **56**.

Thus, the drawer frame **19** can be smoothly withdrawn from the inside casing **41**.

As shown in FIG. **3**, the inside casing **41** includes the reinforcing portion **83** trade of metal. The reinforcing portion **83** includes the first reinforcing member **86** extending frontward from the right end portion of the lower end of the rear wall **43**, the second reinforcing member **87** extending rightward from the front end portion of the lower end of the left wall **44**, and the third reinforcing member **88** extending downward from the L-shaped portion, as viewed from the top, formed by the front end portion of the right end of the upper wall **45** and the right end portion of the front end of the upper wall **45**. The front end portion of the first reinforcing member **86**, the right end portion of the second reinforcing member **87**, and the lower end portion of the third reinforcing member **88** are coupled to each other. Thus, the inside casing **41** is reinforced.

Thus, with a, simple structure, an improvement in the structural strength of the inside casino **41** can be obtained.

As shown in FIG. **1**, the printer **1** includes the belt unit **26**, which is disposed above the four photosensitive drums **20** and opposite to the four photosensitive drums **20** vertically, and the developing units **22**, which are disposed under the photosensitive drums **20** respectively and configured to supply toner to the respective photosensitive drums **20**.

Thus, toner can be supplied to each of the photosensitive drums **20** reliably.

The belt unit **26** includes the intermediate transfer belt **30**, which is disposed above the photosensitive drums **20** along the left-right direction (or the arrangement direction of the photosensitive drums **20**), and the four primary transfer rollers **31**, which are disposed opposite to the respective photosensitive drums **20** in the top-bottom direction (vertically) with the intermediate transfer belt **30** interposed therebetween.

The printer **1** further includes the secondary transfer roller **27** which is disposed opposite to the right end portion of the intermediate transfer belt **30**.

Thus, the printer **1** can transfer toner images onto a sheet P without the need to pass the sheet P between the photosensitive drums **20** and the belt unit **26**, compared with a direct-tandem type printer where toner images carried on the respective photosensitive drums are directly transferred onto a sheet P.

As a result, the sheet conveyance path can be simplified.

As shown in FIG. **4**, the belt unit **26** is positioned relative to the first sheet metal member **67**.

In other words, the photosensitive drums **20** and the belt unit **26** are positioned relative to the first sheet metal member **67**.

As a result, an improvement in the relative positioning accuracy of the photosensitive drums **20** and the belt unit **26** can be obtained.

The printer **1** further includes the LED units **16** configured to expose the respective photosensitive drums **20**.

Thus, the photosensitive drums **20** can be exposed by the LED units **16** whose size is small compared with a scanner which emits laser beams to expose the photosensitive drums **20**. Thus, the need to increase the physical size of the printer **1** can be obviated.

A second embodiment will be described.

FIG. **8** is a perspective view illustrating an inside casing of a printer according to the second embodiment of the disclosure.

It is noted that throughout FIGS. **1** to **7** elements similar to or identical with those shown in and described with reference to FIG. **8** are designated by similar numerals, and thus the description thereof can be omitted for the sake of brevity.

In the first embodiment, as shown in FIG. **3**, the second sheet metal member **68** is disposed on the rear surface of the rear wall **43**. In the second embodiment, as shown in FIG. **8**, the second sheet metal member **68** is disposed on a front surface of the rear wall **43** for an inside surface in the axial direction of the photosensitive drums **20**).

Thus, even with the second embodiment, it is clear that effects similar to those brought about by the first embodiment can be appreciated.

As the second sheet metal member **68** is fittingly accommodated in the inside casing **41**, a space in the inside casing **41** can be effectively used, and the need to increase the physical size of the printer I can be obviated.

While the features herein have been described in connection with various example structures and illustrative aspects, it will be understood by those skilled in the art that other variations and modifications of the structures and aspects described above may be made without departing from the scope of the inventions described herein. Other structures and aspects will be apparent to those skilled in the art from a consideration of the specification or practice of the features disclosed herein. It is intended that the specification and the described examples only are illustrative with the true scope of the inventions being defined by the following claims.

What is claimed is:

1. An image forming apparatus comprising:

a process unit including a plurality of photosensitive drums and a holding unit holding the plurality of photosensitive drums, the plurality of photosensitive drums being spaced apart from each other and arranged such that axes of the photosensitive drums are parallel relative to each

other in an arrangement direction perpendicular to an axial direction of the photosensitive drums;

a frame member configured to accommodate the process unit such that the process unit is inserted into and withdrawn from the frame member along the axial direction; the frame member including:

a first sheet metal member disposed on a first side of the frame member,

a second sheet metal member disposed on a second side of the frame member spaced apart from and facing the first sheet metal member in the axial direction;

a first wall disposed on the second side of the frame member;

a second wall disposed on a third side of the frame member, the third side connecting the first side and the second side, the second wall being connected to the first wall; and

a third wall disposed on an upper side relative to the photosensitive drum, the third wall being connected to the first wall and the second wall; and

a pressing member configured to press the process unit such that the pressing member moves in a direction diagonally upwardly toward the first sheet metal member and inwardly away from the second wall,

wherein the frame member has an opening below the first sheet metal member and the process unit including the plurality of photosensitive drums is configured to be inserted into and removed from the frame member through the opening below the first sheet metal member along the axial direction, and

wherein a lower end of the first sheet metal member includes a contact portion configured to, when the process unit is accommodated in the frame member, contact the process unit to position the plurality of photosensitive drums included in the process unit relative to the frame member.

2. The image forming apparatus according to claim **1**, wherein the first wall, the second wall, and the third wall are integrally made of resin.

3. The image forming apparatus according to claim **1**, wherein the frame member includes a resin-made frame, which is made of resin and disposed on the first side of the frame member, the first sheet metal member is fixed to an outer surface of the resin-made frame in the axial direction, and the second sheet metal member is fixed to an outer surface of the first wall in the axial direction.

4. The image forming apparatus according to claim **1**, wherein the frame member includes a resin-made frame, which is made of resin and disposed on the first side of the frame member, the first sheet metal member is fixed to an outer surface of the resin-made frame in the axial direction, and the second sheet metal member is fixed to an inner surface of the first wall in the axial direction.

5. The image forming apparatus according to claim **1**, further comprising a reference shaft extending in the axial direction between the first sheet metal member and the second sheet metal member.

6. The image forming apparatus according to claim **5**, wherein the holding unit includes a first engagement portion configured to, when the process unit is accommodated in the frame member, engage the contact portion of the first sheet metal member and the second sheet metal member, and a second engagement portion configured to, when the process unit is accommodated in the frame member, engage the reference shaft.

7. The image forming apparatus according to claim **6**, wherein the first engagement portion is disposed at each end portion in the axial direction in a first end portion of the holding unit in the arrangement direction, and the second engagement portion is disposed at each end portion in the axial direction in a second end portion, opposite to the first end portion, of the holding unit in the arrangement direction.

8. The image forming apparatus according to claim **6**, wherein the first engagement portion includes a protrusion protruding outward from the holding unit in the axial direction, and the second engagement portion includes a groove portion recessed inward from the holding unit in the arrangement direction.

9. The image forming apparatus according to claim **1**,

wherein the frame member includes a first guide portion and a second guide portion connected to a downstream end portion of the first guide portion in a direction where the holding unit is inserted into the frame member, the first guide portion is configured to move the holding unit in the axial direction, and the second guide portion is configured to guide the holding unit in the axial direction and vertically, and

wherein the holding unit includes a guided portion to be guided by the first guide portion and the second guide portion and to contact the first guide portion and the second guide portion from above.

10. The image forming apparatus according to claim **1**, wherein the frame member includes:

a first reinforcing member made of metal and extending from the first wall toward the first side in the axial direction;

a second reinforcing member made of metal and extending from the second wall toward a fourth side opposite to the third side in the arrangement direction; and

a third reinforcing member made of metal and extending downward from the third wall, and

wherein the first reinforcing member, the second reinforcing member and the third reinforcing member are coupled to each other.

11. The image forming apparatus according to claim **1**, further comprising a belt unit disposed above the process unit accommodated in the frame member;

wherein the holding unit is configured to hold a plurality of developing units below the photosensitive drums respectively, each of the developing units being configured to supply a developer to a corresponding one of the photosensitive drums.

12. The image forming apparatus according to claim **11**, wherein the belt unit includes:

an intermediate transfer belt disposed above the photosensitive drums along the arrangement direction;

a plurality of primary transfer rollers disposed facing the photosensitive drums respectively vertically with the intermediate transfer belt interposed between the primary transfer rollers and the photosensitive drums; and

a secondary transfer roller disposed opposite to an end portion of the intermediate transfer belt in the arrangement direction.

13. The image forming apparatus according to claim **11**, wherein the belt unit is positioned relative to the first sheet metal member.

14. The image forming apparatus according to claim **1**, further comprising a plurality of LED units each configured to expose a corresponding one of the photosensitive drums.

15. The image forming apparatus according to claim 1, wherein the contact portion of the first sheet metal member protrudes downward from the lower end of the first sheet metal member, and the process unit includes a contact portion configured to, when the process unit is accommodated in the frame member, contact the contact portion of the first sheet metal member from below.

16. The image forming apparatus according to claim 15, wherein the holding unit of the process unit includes the contact portion.

* * * * *